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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/015,446	12/12/2001	Norio Kanetsuki	56775(70551)	4596
21874	7590	02/24/2004	EXAMINER	
EDWARDS & ANGELL, LLP P.O. BOX 55874 BOSTON, MA 02205			VINH, LAN	
			ART UNIT	PAPER NUMBER
			1765	
DATE MAILED: 02/24/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

AS

Office Action Summary	Application No. 10/015,446	Applicant(s) KANETSUKI ET AL.	
	Examiner Lan Vinh	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 10/015,446.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

1. Claim 15 is objected to because of the following informalities: In line 2 of claim 15, the term "files" appears to be a typographical error, the examiner suggests replacing "files" with --films--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless —

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 3-6, 11-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsunaga et al (US 5,830,807)

Matsugana discloses a successive dry etching method of alternating laminate layers. This method using a mixed process gas supplied into a process chamber 1 to generate plasma to etch/process a wafer/substrate (col 4, lines 1-15). Matsugana discloses that the substrate having an alternate laminate of silicon oxide and silicon film to be etched and the gas mixture ratio is changed in accordance with the material of a film to be etched (col 4, lines 25-41; col 5, lines 5-10), which reads on the substrate includes stacked films of at least two types to be etched, and according to any of the films that to be etched, a change is made in the process gas in a plasma generation period

Regarding claims 3-5, 11-13, Matsugana discloses changing the pressure of the process gas (a plasma generating condition for stably maintaining generation of the plasma) together/simultaneously with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period (col 7, lines 50-55)

Regarding claims 6, 14, Matsugana disclose changing the power when the amount of gas is changed to give more directivity to the plasma etching (col 56-60)

4. Claims 7-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Watanabe et al (US 6,156,663)

Watanabe discloses a plasma processing method using a process gas supplied into a process chamber (see abstract). This method comprises placing a substrate 100 includes a stacked films of one TiN layer /Ti-based film 102 and one TiN layer 104 (claimed one film other than a Al-based film (col 6, lines 50-55), the films are serially etched (col 7, lines 6-8), changing the gas composition, pressure and power resulting in the etching of the layers 102 and 104 (col 7, lines 9-16; fig. 5(b) and fig 5(c)), which reads on a change is made in the process gas in a plasma generation period according to any of the films that to be etched

The limitation of claim 8 has been discussed above.

Regarding claim 9, Watanabe discloses that the process gas includes Cl₂ and Ar (col 7, lines 13-15)

5. Claims 15-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Watanabe et al (US 6,156,663)

Watanabe discloses a plasma processing method using a process gas supplied into a process chamber (see abstract). This method comprises placing a semiconductor substrate 100 includes a stacked layers/films into a process chamber (col 6, lines 50-55, col 7, lines 4-6), etching the stacked films by supplying a first gas composition into the process chamber (col 7, lines 10-12). Watanabe discloses that the stacked layers are serially etched and Watanabe is also silent about stopping the generation of plasma after the etching using the first gas composition/first etching (col 7, lines 5-7), which reads on completing the first etching without extinguishing the plasma, etching the stacked films by supplying a second gas composition into the process chamber, the second gas composition id different from the first gas composition (col 7, lines 12-15). Watanabe is silent about stopping the generation of plasma between the two etching steps, which reads on the plasma is maintained without being extinguished until the second etching is started.

The limitation of claim 16 has been discussed above.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 2, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsugana et al (US 5,830,807) in view of Chung (US 5,658,820)

Matsugana's method has been described above. Unlike the instant claimed inventions as per claims 2,10, Matsugana does not disclose changing the bias voltage applied to the substrate together with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period.

However, Chung discloses a method for manufacturing a ferroelectric capacitor by etching a stacked layers structure comprises the step of increasing/changing the DC bias voltage applied to the substrate holder while varying the gas mixture ratio during the etching period (col 4, lines 4-44, fig. 8 and fig. 10). Chung teaching reads on changing the bias voltage applied to the substrate together with the change made in the process gas/changing the gas mixture ratio in the plasma generation period/etching period.

Hence, one skilled in the art would have found it obvious to modify Matsugana's method by applying a changing bias voltage to the substrate while varying the gas mixture ratio during the etching period as per Chung because according to Chung increasing the bias voltage is one of the optimum condition for increasing the selectivity of one layer with respect to the other layer in the stacked structure during etching (col 4, lines 59-63)

8. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al (US 6,156,663) in view of Whetten (US 5,153,754)

Watanabe's method has been described above. Unlike the instant claimed invention as per claim 17, Watanabe fails to specifically disclose processing/etching the stacked layers on the substrate to form a liquid-crystal display device (LCD)

However, Whetten discloses a method for forming a LCD comprises the step of processing/plasma etching the stacked layers on the substrate to form a liquid-crystal display device (LCD) (col 6, lines 45-47, col 6, lines 66-68)

Hence, one skilled in the art would have found it obvious to employ Watanabe step of etching a stacked layers to form a LCD in view of Whetten's teaching because according to Whetten, the plasma etch will etch the Ti layers simultaneously and at the same rate, to prevent undercutting and possible step coverage problem (col 6, lines 66-68)

Response to Arguments

9. The applicants argue that Matsugana does not describe each and every element of applicants' claim 1, in particular Matsunaga does not describe a process wherein "a change is made in the process gas in a plasma generation period, in particular, Matsunaga does not describe a process wherein a change is made in the process gas in a plasma generation period without extinction/regeneration of the plasma. This argument is unpersuasive based on two reasons. First at all, the argument that in particular, Matsunaga does not describe a process "wherein a change is made in the process gas in a plasma generation period without extinction/regeneration of the plasma" does not commensurate with the scope of claim 1 since claim 1 does not

require " a change is made in the process gas in a plasma generation period without extinction/regeneration of the plasma". In addition, since claim 1 recites a process wherein " a change is made in the process gas in a plasma generation period" and Matsugana discloses that the gas mixture ratio and etching conditions are changed in accordance with the material of a film to be etched (col 5, lines 5-10), Matsunag's teaching reads on a change is made in the process gas in a plasma generation period. Hence, the examiner asserts that Matsugana describes each and every element of applicants' claim 1.

Applicants argument that Matsunaga does not describe changing the plasma generating condition together with the process gas is unpersuasive because as shown in col 5, lines 1-10 of Matsugana, the RF power is changed together with the change of the gas flow ratio. Matsugana also discloses changing the pressure of the process gas with the change made in the process gas (col 7, lines 50-55). Thus, the examiner asserts that Matsunaga describes changing the plasma generating condition together with the process gas.

Applicant's arguments with respect to claim 7 have been considered but are moot in view of the new ground(s) of rejection.

In response to applicant's argument that there is no suggestion to combine the references of Matsunaga and Chung because Matsunaga does not describe or suggest changing the bias voltage applied to the substrate together with the process gas, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is

some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since the motivation to combine the references (the advantage of applying increasing/changing bias voltage as taught by Chung) comes from one of the reference, one skilled in the art would have found it obvious to employ Chung teaching in Matsunaga's method to produce the claimed invention.

The applicants further argue that Chung does not disclose or suggest the step of increasing/changing the DC bias voltage applied to the substrate holder while varying the gas mixture ratio during the etching period because Chung describes an etching step wherein Ar, chlorine and fluorine gases of a predetermined composition ratio are injected into the etching chamber and RF power of a predetermined frequency and power are applied, the predetermined values are used and are not varied. The examiner disagrees because as shown in fig. 8 of Chung, the etching rate of the PZT layer increases/varies as the gas mixture ratio changes and fig. 10 of Chung clearly shows that the etching rate of the PZT also increases as the DC bias (DC bias voltage applied to the substrate holder) increases/varies. Thus, the examiner asserts that the values of gas mixture ratio and DC bias vary in Chung and thus Chung discloses the step of increasing/changing the DC bias voltage applied to the substrate holder while varying the gas mixture ratio during the etching period.

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10. Applicant's amendment necessitated the new ground(s) of rejection of claims 7-9, 15-17 presented in this Office action. The examiner also maintains the rejection of claims 1-6, 10-14 as being anticipated by Matsunaga. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



LV
February 11, 2004